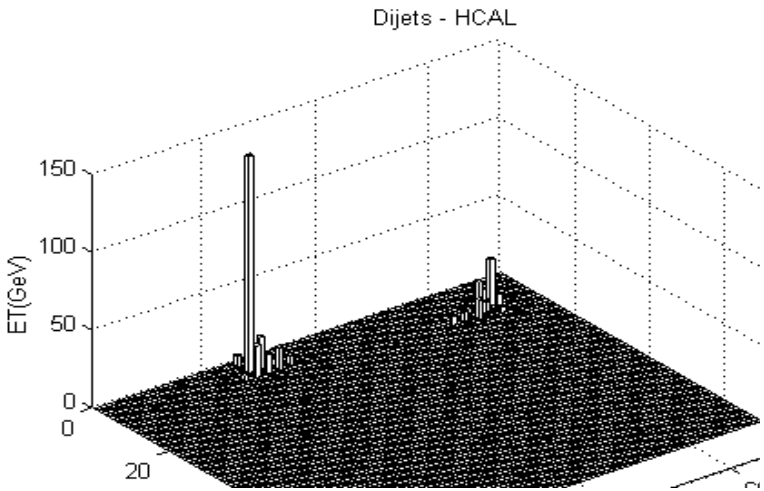
Z(700) Data and Calibration

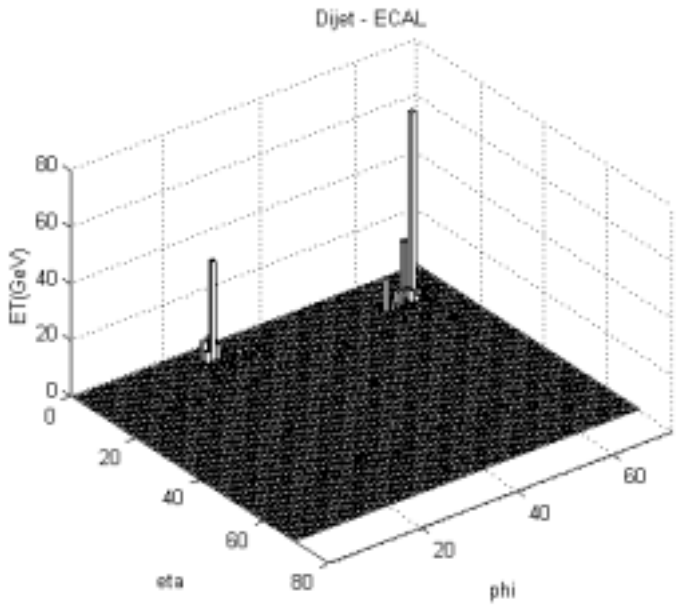
Dan Green

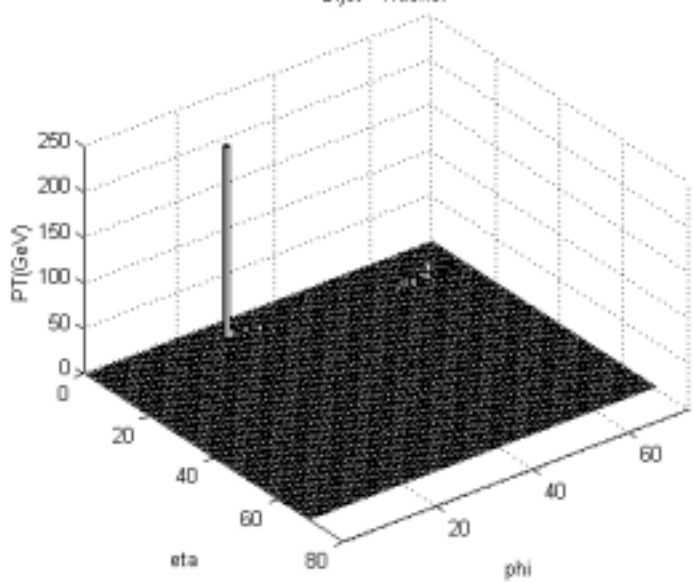
Fermilab

June, 2001

Dijet LEGO Plot - Full

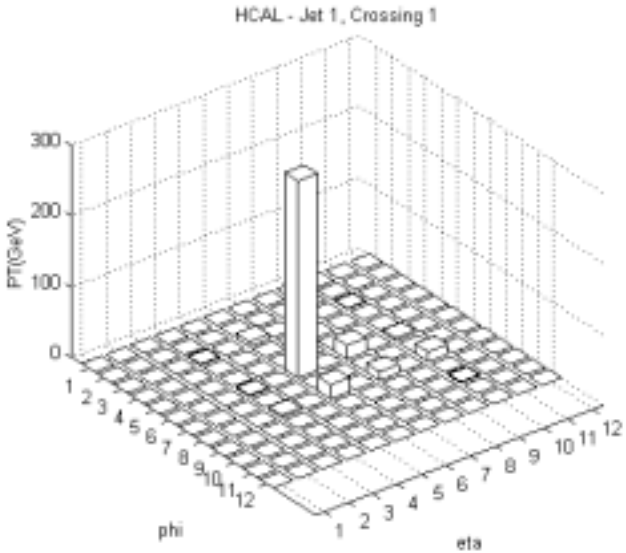


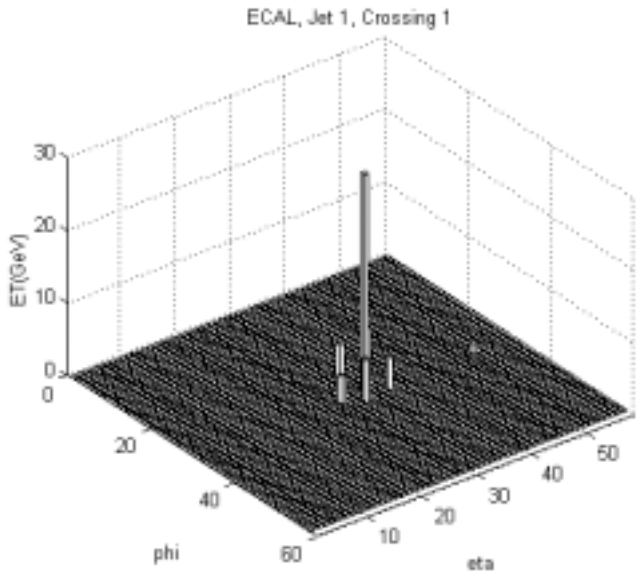


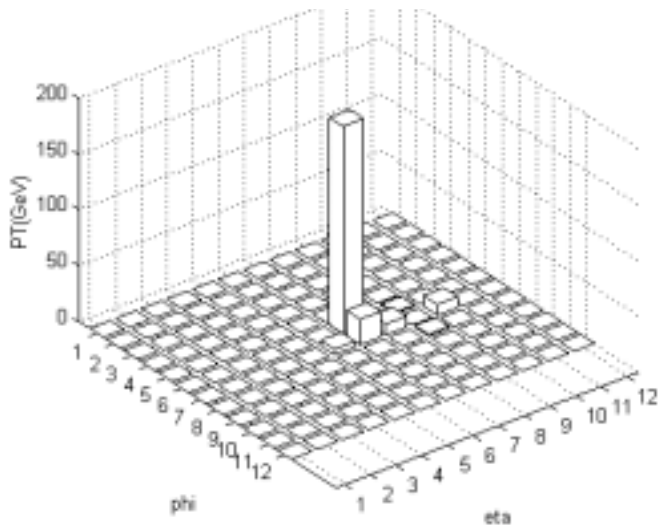


Z'(700) events - full LEGO plot and tracker correlation. Jet 1 is largely hadronic.

Zoom to R = 0.5

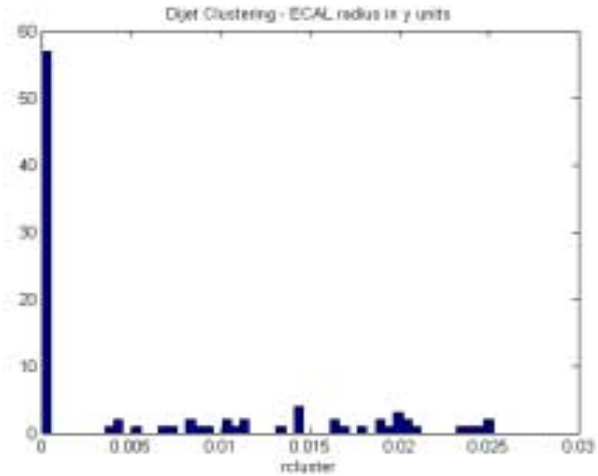


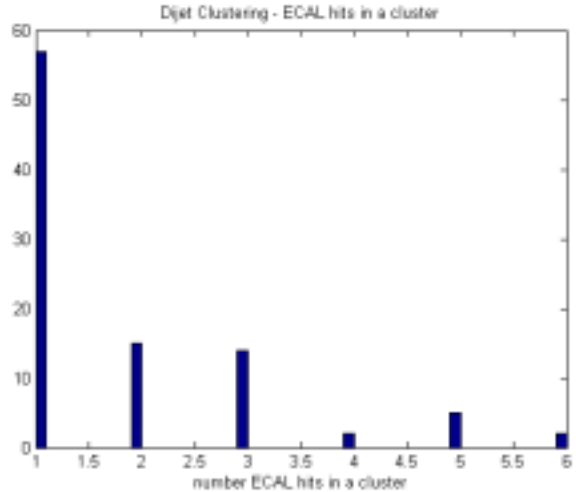




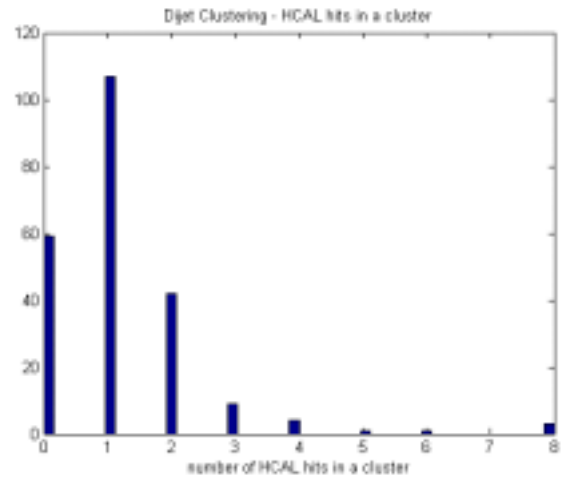
Structure of Jet1 in ECAL, HCAL, and tracker correlation. Attempt to resolve individual pions/photons. ECAL is very finely grained.

Clustering in ECAL + HCAL

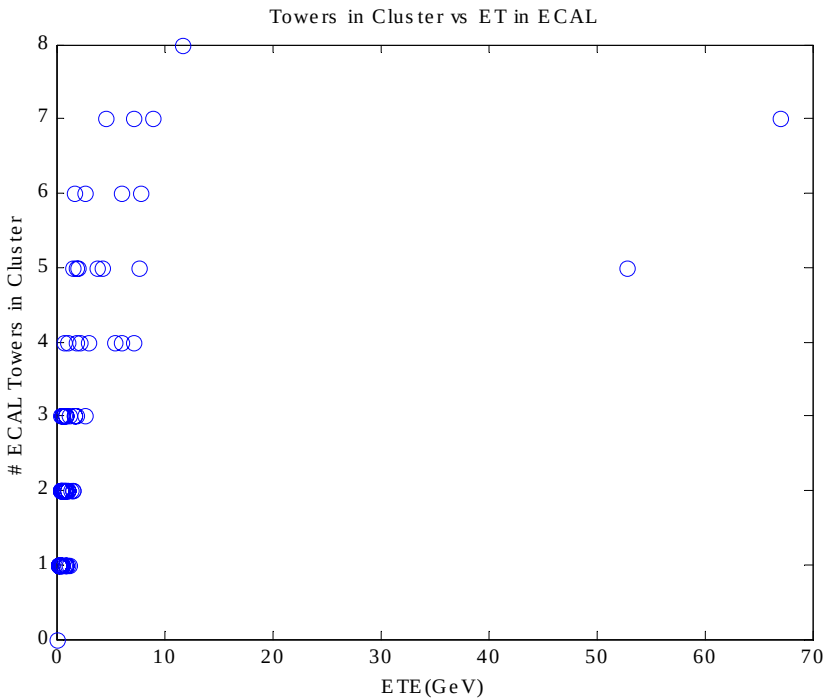


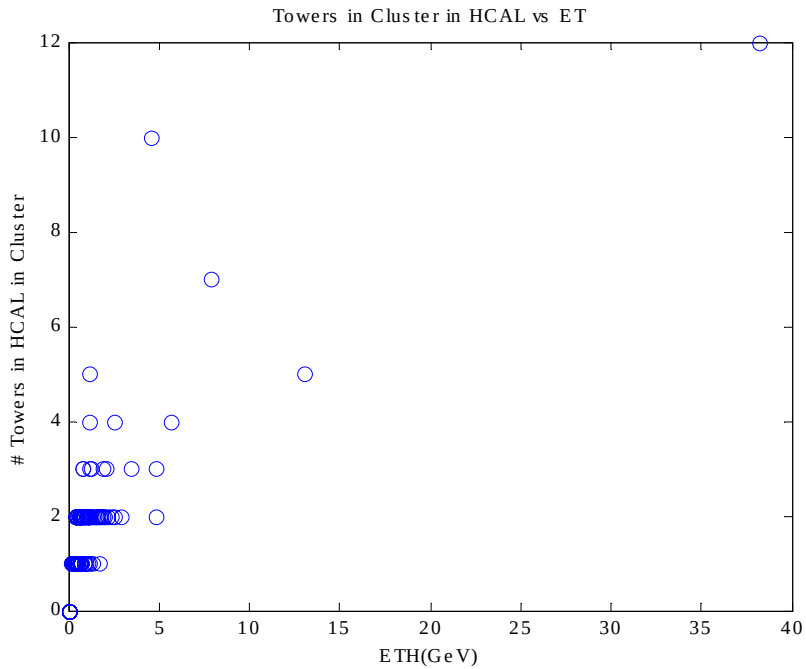


Start in ECAL - seed > 0.2 GeV. Add ECAL clusters for R < 0.025 (3 x 3) and ET > 0.1 GeV. Then, look in HCAL , 3 x 3 (0.125) behind. Call the result a pion interacting in ECAL (flag = 1) if HCAL energy > 0.5 x ECAL energy, else a photon (flag = 0). For HCAL seed has ET > 0.2 GeV and cluster R < 0.125 (3 x 3).



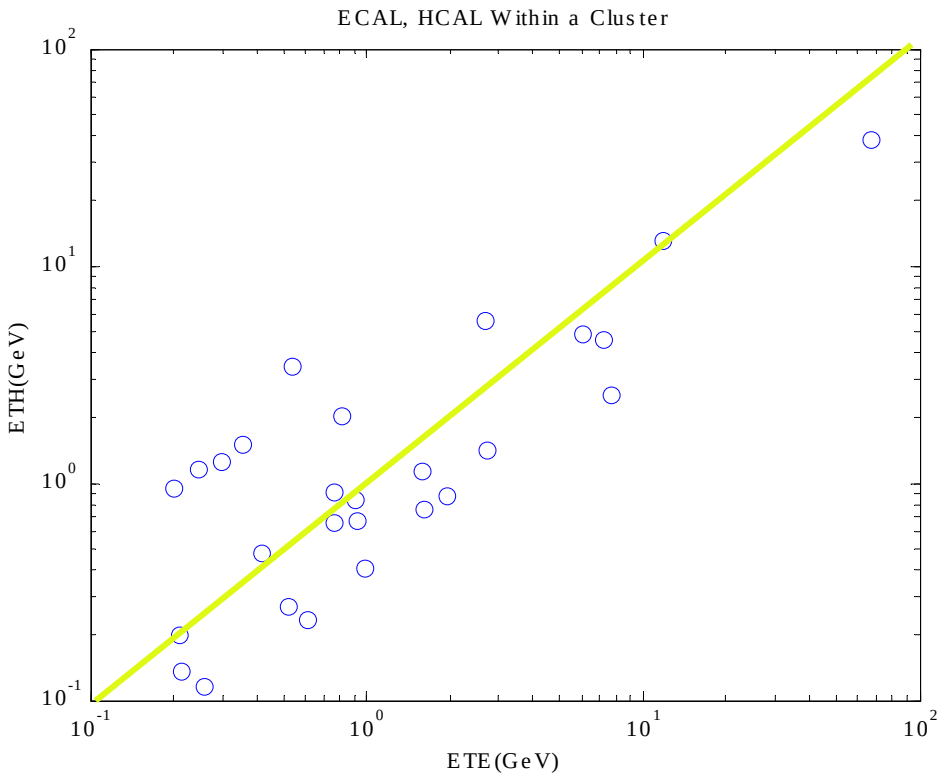
Towers in a Cluster





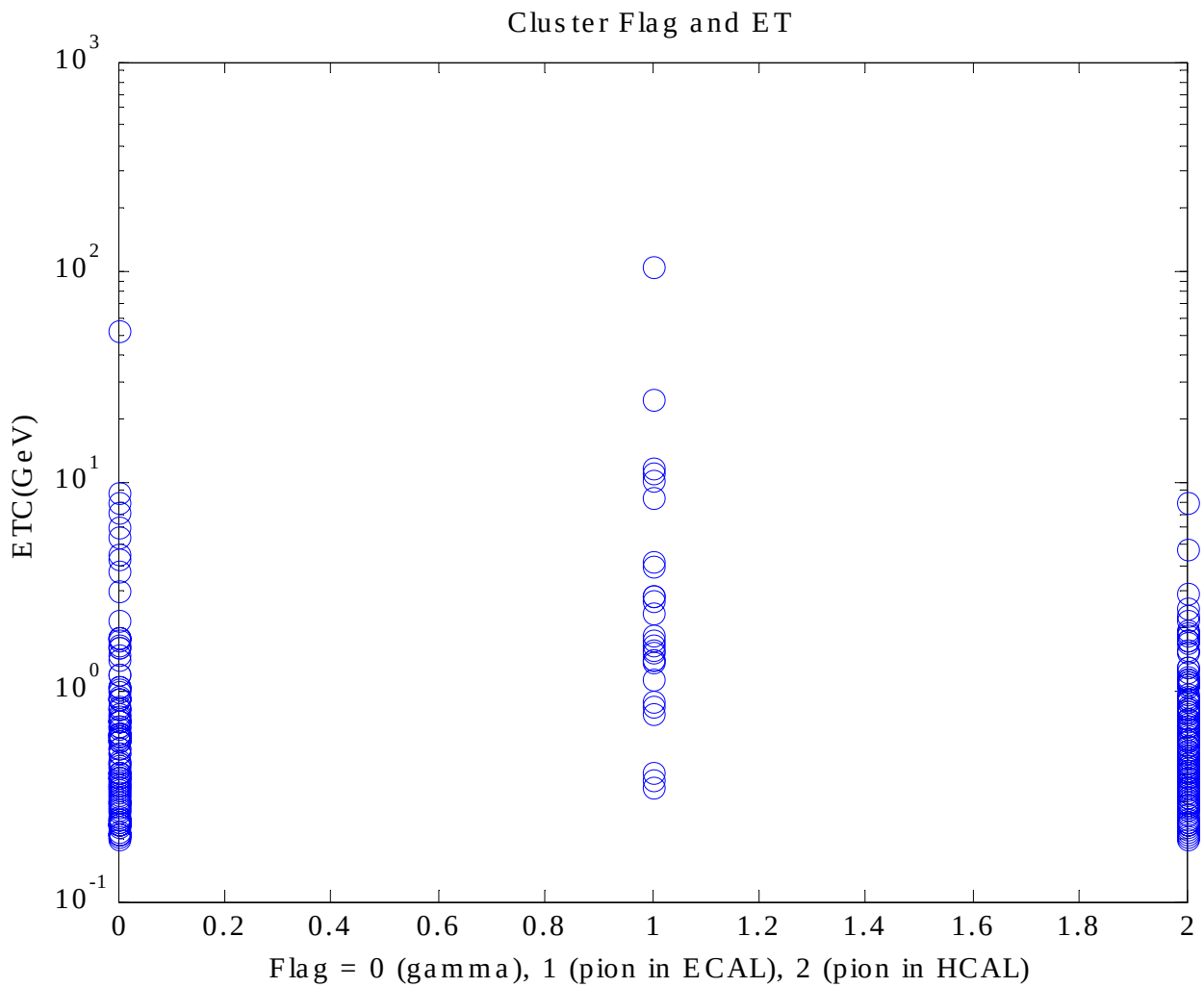
High ET clusters have a "large" number of towers. Low ET are limited to 1 or 2 towers in both ECAL and HCAL.

Clusters

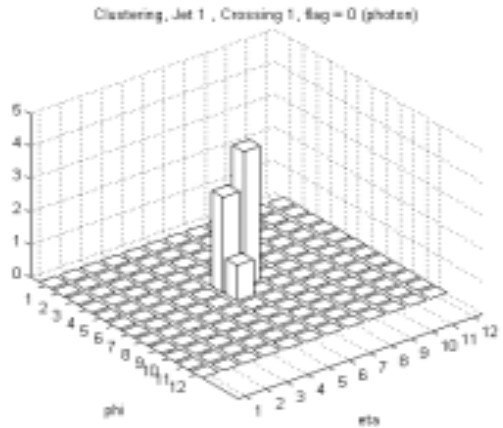


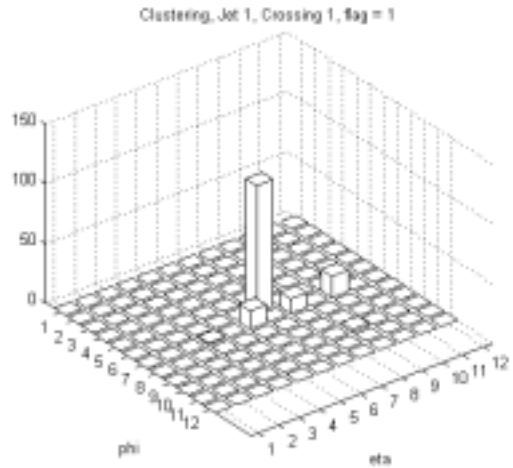
For found clusters, if there is ECAL and HCAL energy, then ~ 1/2 is in ECAL.

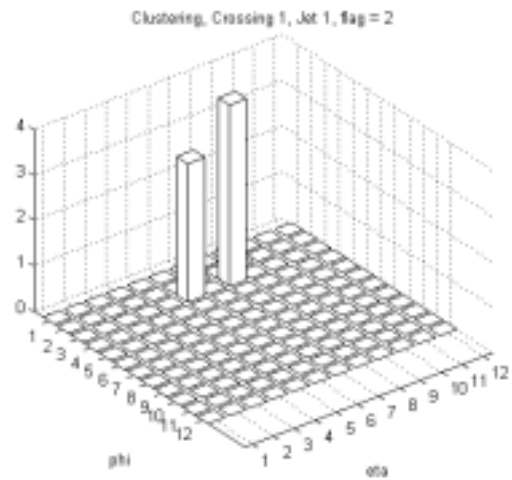
Flags of Clusters

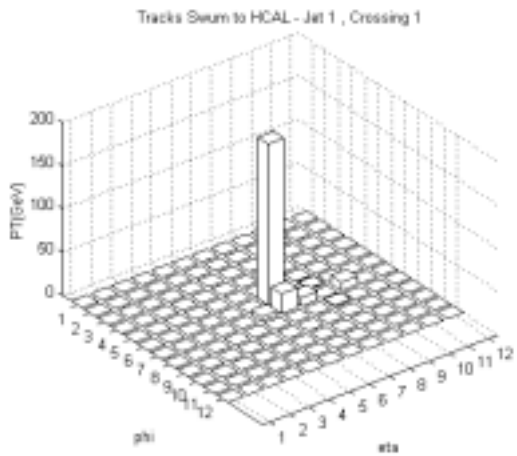


Zoom in R < 0.5, Clustering



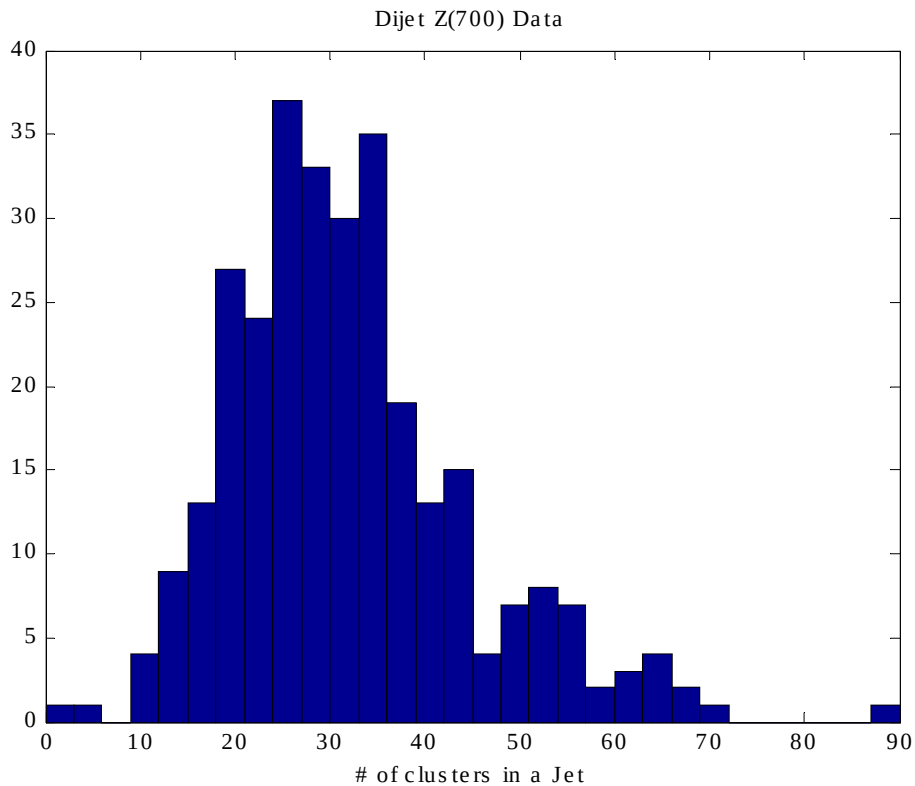






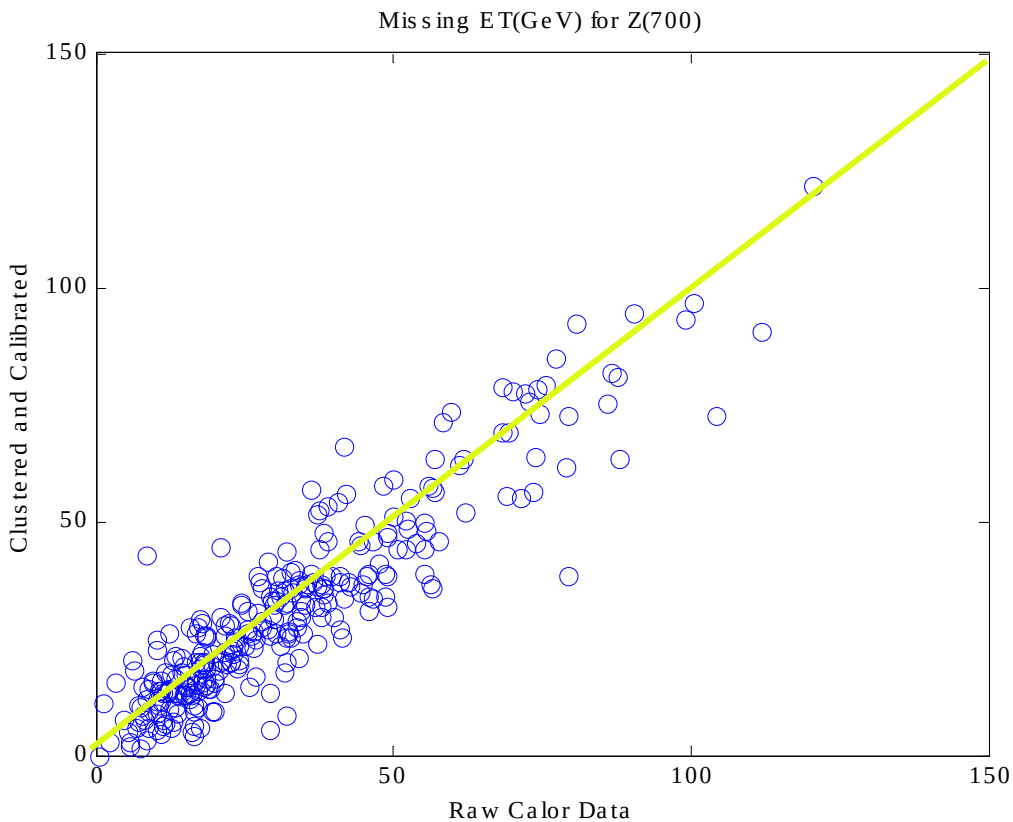
Clustering is needed to correct for different calibrations which depend on the choice of photon or pion. Jet 1 is confirmed to be largely hadronic.

Clusters in a Jet



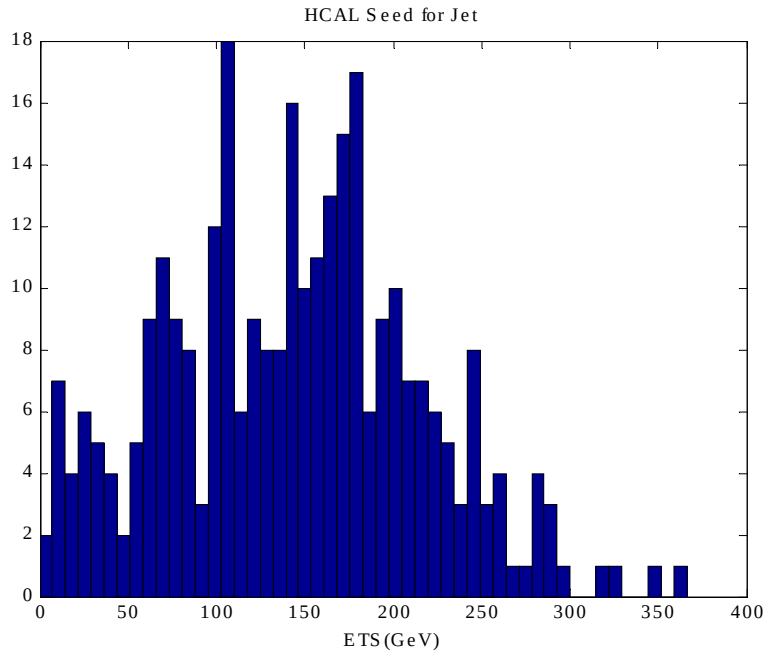
A jet with R = 0.7 has ~ 200 HCAL towers. The number of clusters in the jet is <nc> = 32. The average cluster has 1.1 HCAL towers. Thus the occupation is fairly sparse.

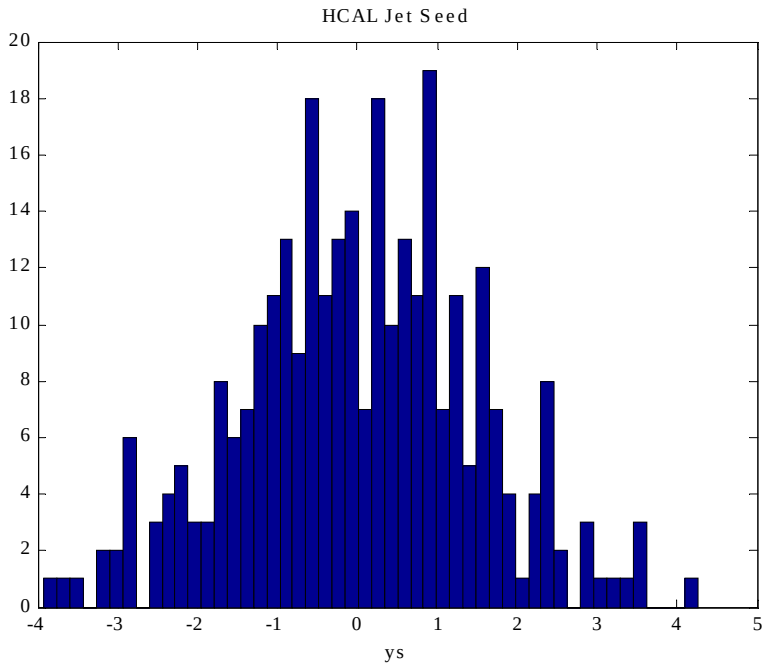
Missing Energy - Cluster/Calibrate



<ET> = 32.7 GeV --> 31.9 GeV. <Sum(ET)> = 630 GeV. Calibration using the single particle test beam procedure leads to only marginal improvement.

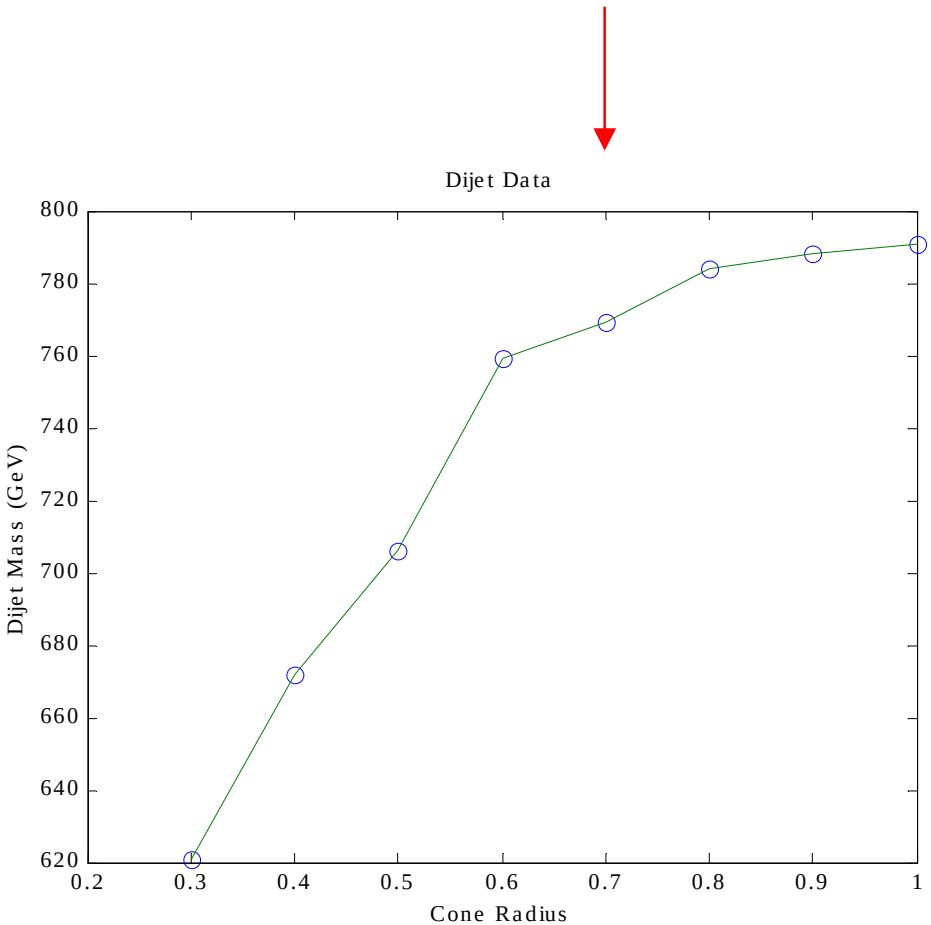
Jet Seed





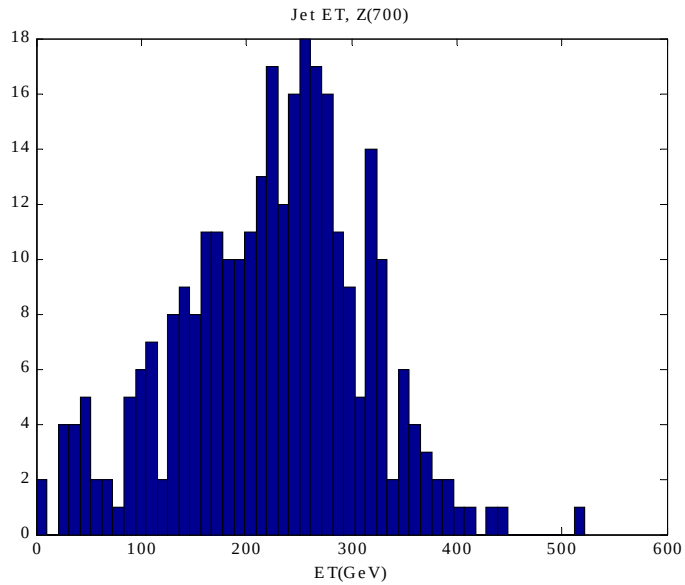
Look for maximum ET in HCAL. That cluster is a "seed" for the jet. Jet kinematics is defined by a cone centered on the seed as jet axis.

Jet Finding and R Choice



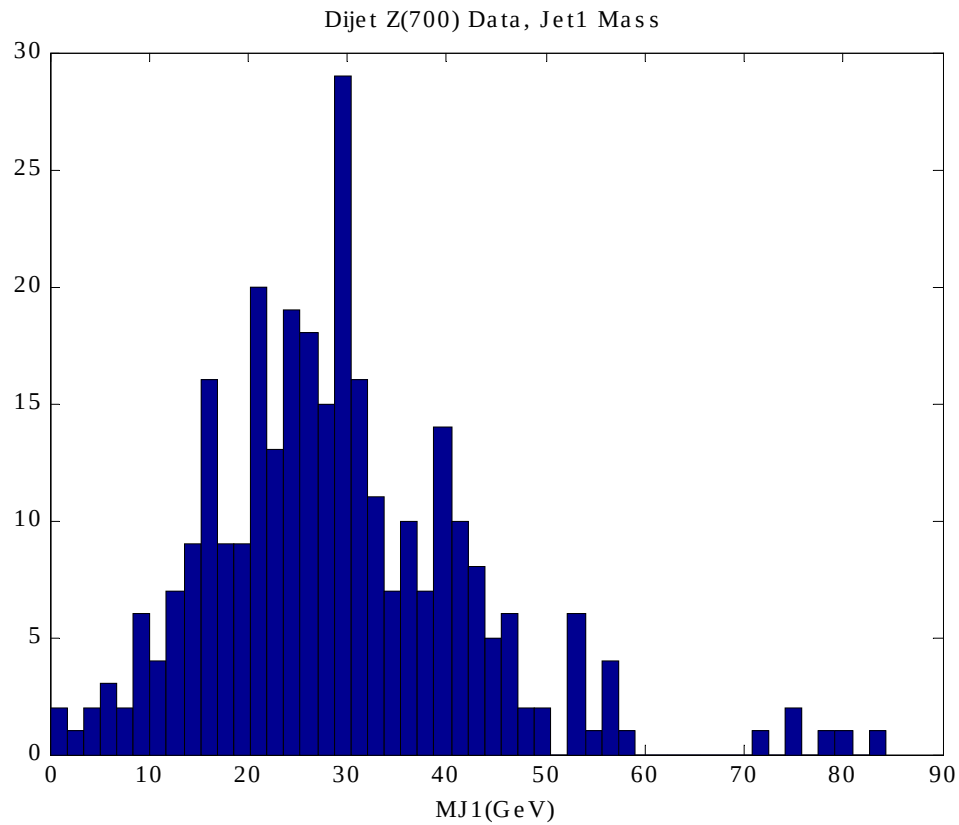
With no pileup events, a cone radius of R = 0.7 is used.

Dijets - ET



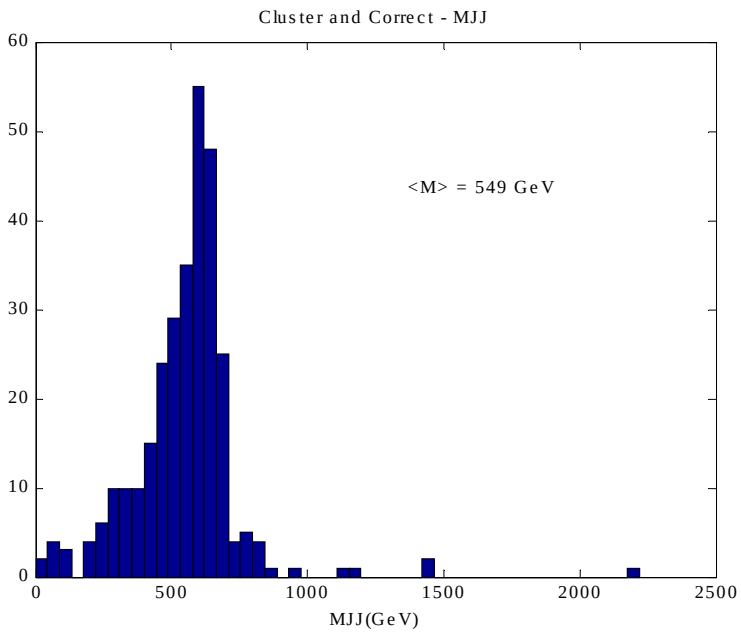
Use assumed calibration for ECAL and HCAL. There are some rather badly measured dijet masses. Low mass can be gluon radiation, but high mass is due to mismeasures. The kinematic maximum is M/2 of 350 GeV.

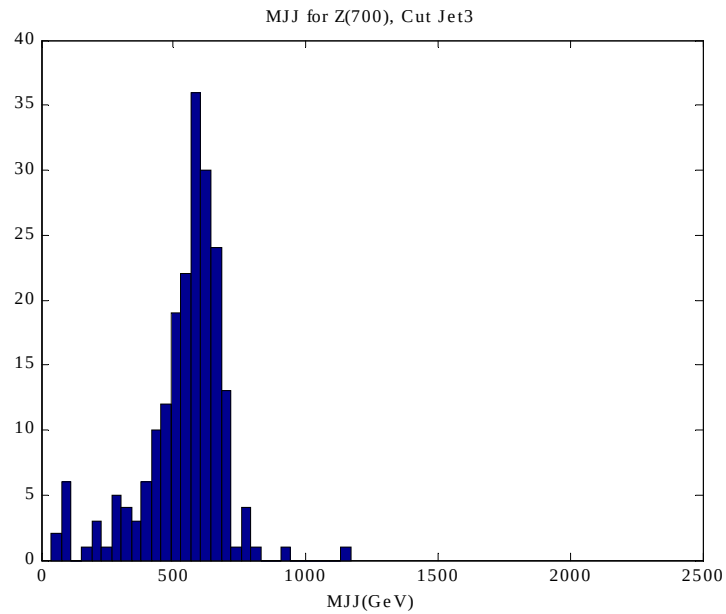
Dijets - Jet Mass = 0 ?



Treat clusters as massless particles. This means that the jet has a mass.

Dijet Mass

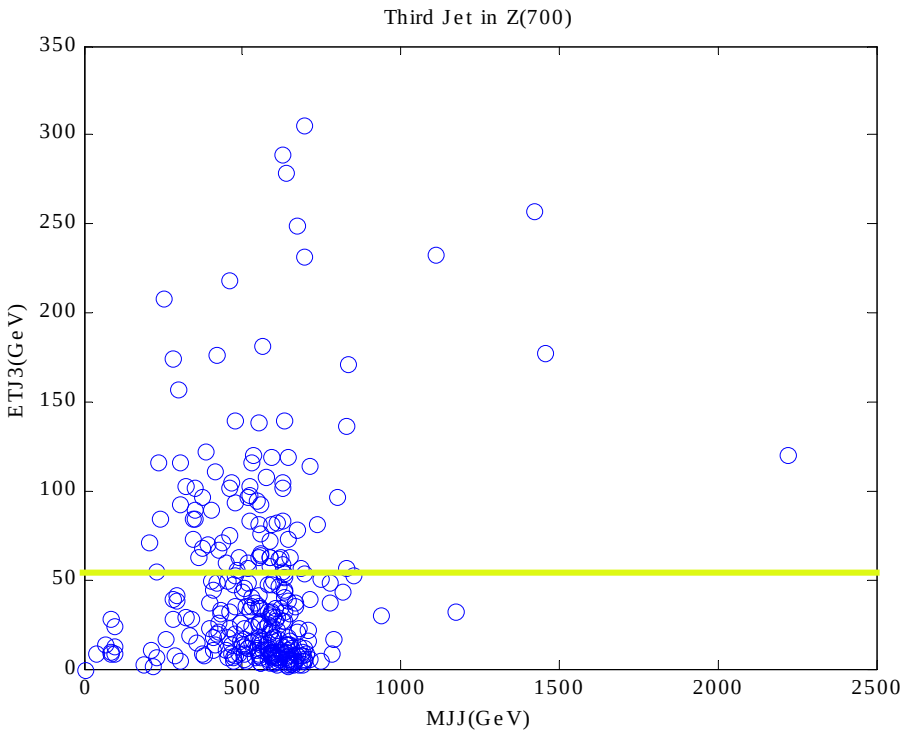




Clustered/calibrated

ET of Jet 3 < 50 GeV

Dijet Mass and Third jet

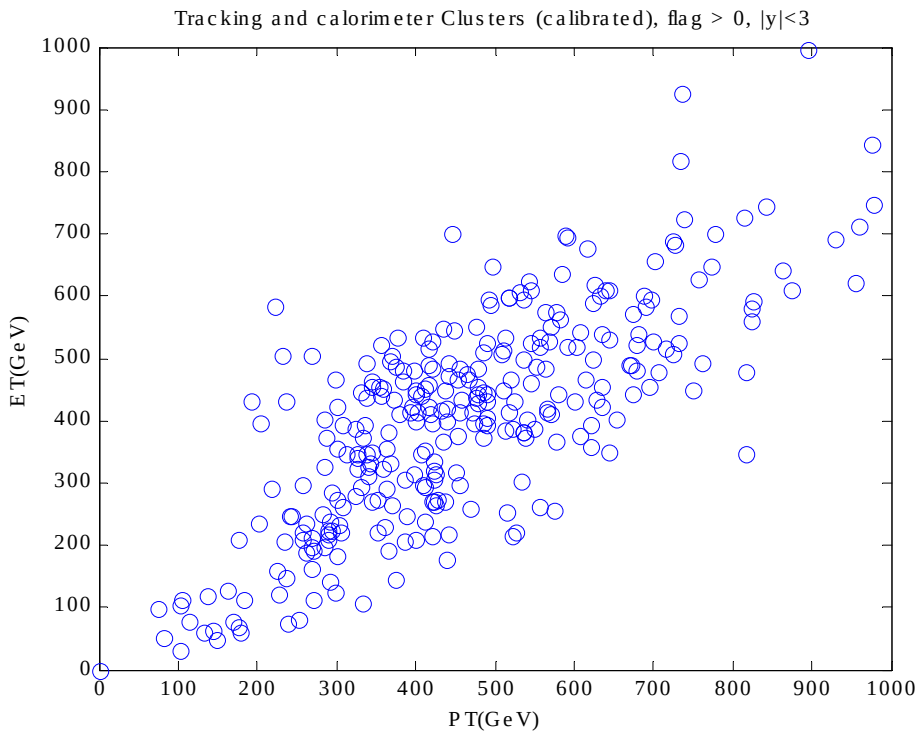


Third Jet is searched for and those with ETJ3 > 50 GeV are removed. This cut removes some major mismeasures of mass.

Next Steps

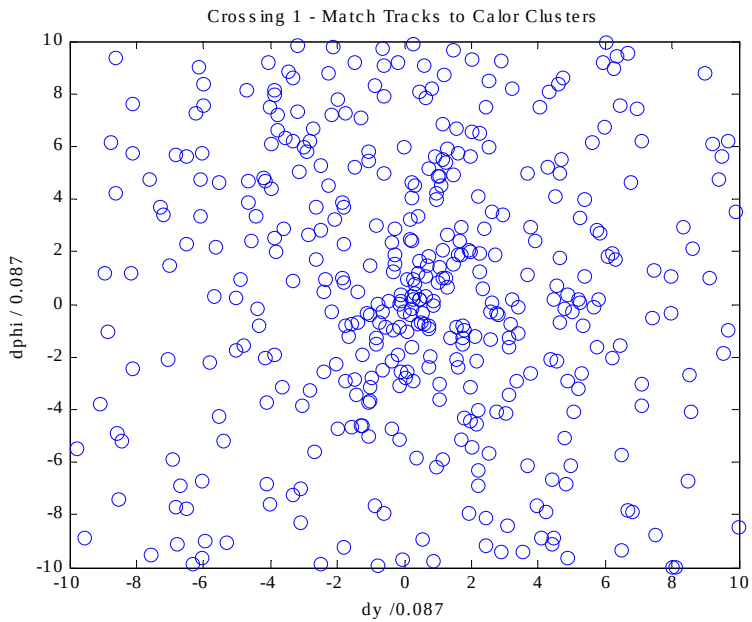
- **Calibration does not appear to be the major cause of jet resolution.**
- **At high mass, the typical particle energy in a jet is still rather small.**
- **Magnetic field sweeping must be taken into account.**
- **Poor resolution at low momentum can be addressed using the tracking information.**

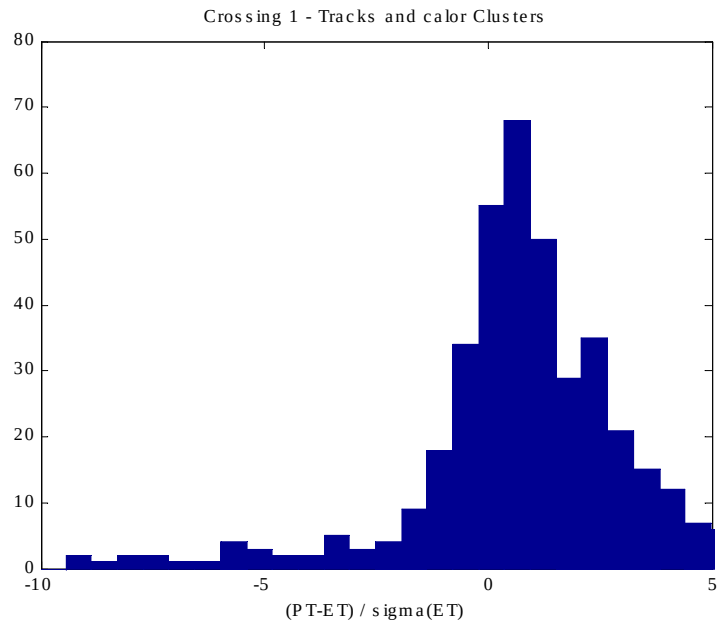
Track/Calor Cluster



Number of clusters and number of tracks are well correlated, as is the sum of PT and ET.

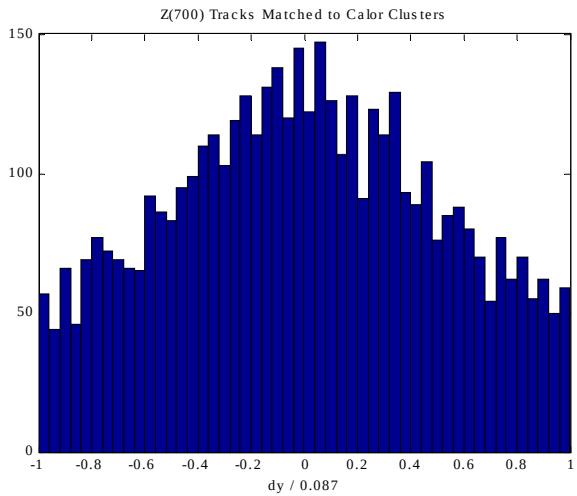
Match in y, phi, ET

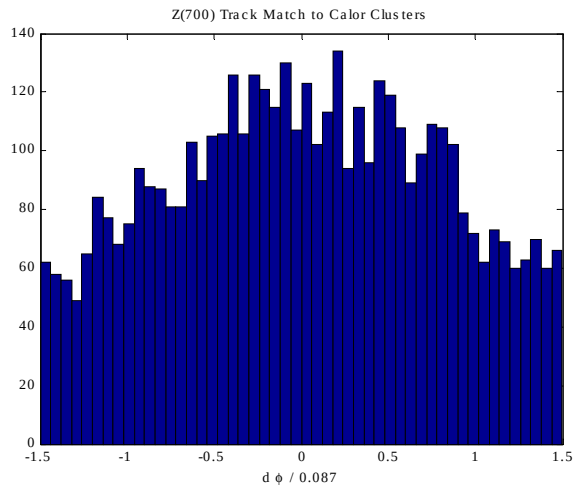


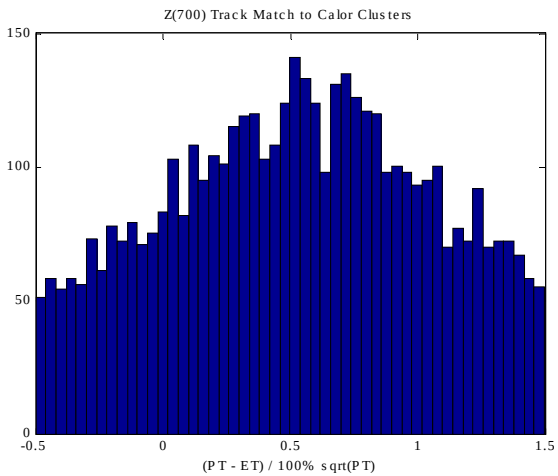


dy and dphi have peaks at 0 with widths in 0.087 units. Cut on |dy /0.087| < 1 and |dphi /0.087 < 1.5. Peak in PT-ET / 100% sqrt(PT) is evident.

Z(700) - Track/Cal Match

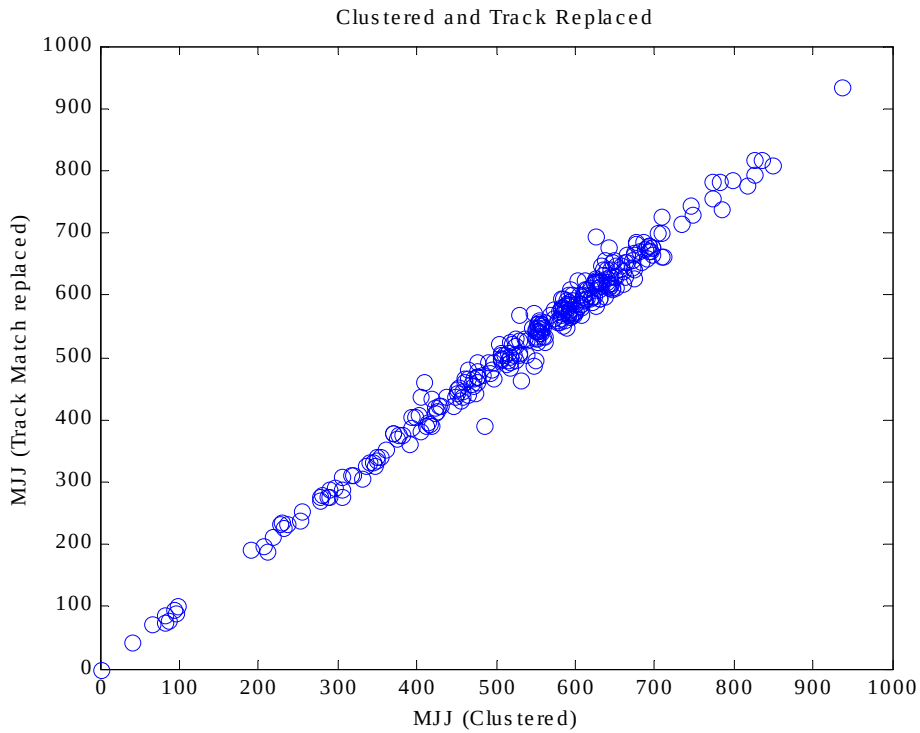






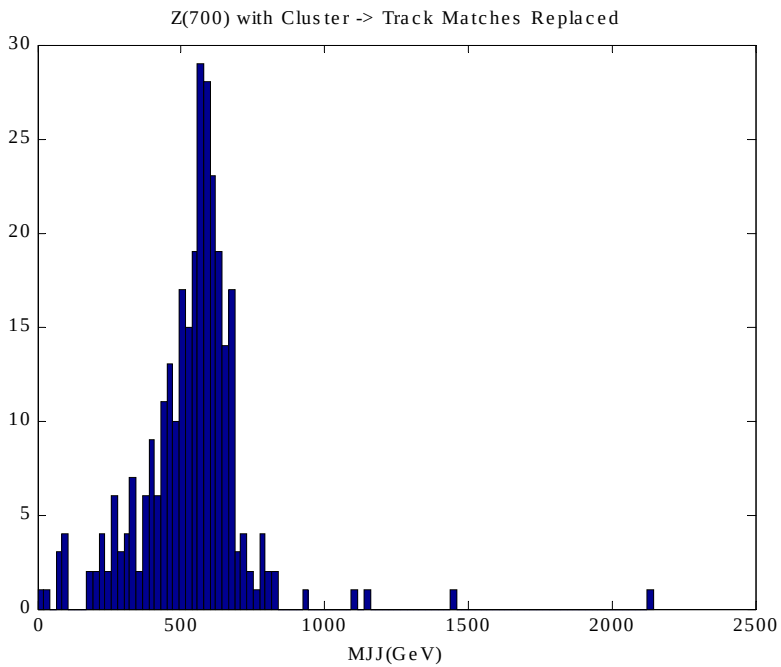
Match simultaneously in y, phi and ET. Note that ET is systematically < PT

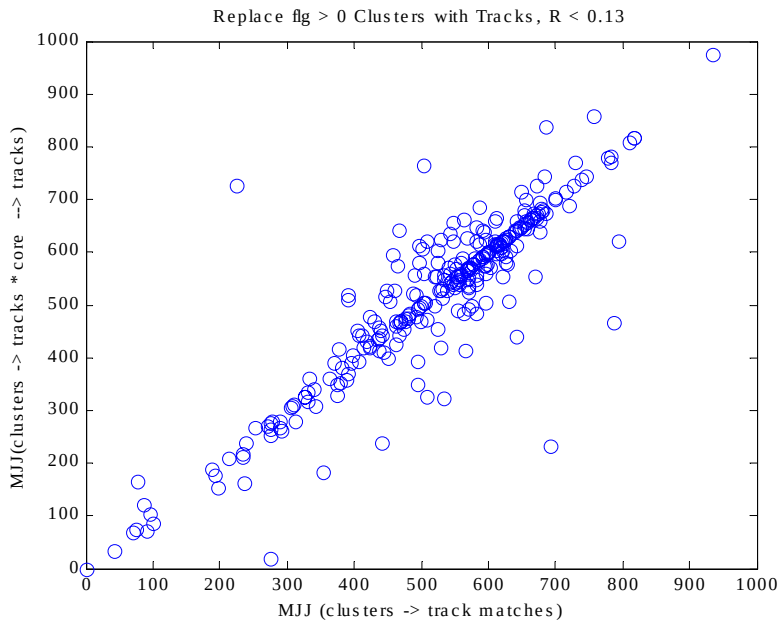
Replace Clusters -> Tracks



Only ~ 50 tracks in |y| < 3 strike the calorimetry with PT > 1 GeV. Of those only ~ 15 match to calorimeter clusters in y, phi, and ET.

Replace Core, R < 0.13?





Core - Clusters , flg > 0